SCIENCE

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SCIENCE

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ERWIN F. SMITH

DR. ERWIN F. SMITH, scientist of the United States Department of Agriculture, whose death occurred on April 6, was one of the chosen few who are given to do great things. The continuous emanation of outstanding contributions to useful knowledge from his laboratories testified, not only to the fruitfulness of his individual efforts, but was significant also of his ability to stimulate and draw out the best talent of the group of unselfish workers with whom he was associated. Considering the modern trend toward individualism in scientific work, this was a mark of high distinction and an outstanding characteristic of the man. One was always impressed by the tone of quiet and unassuming energy and efficiency which prevailed among his devoted coworkers in the laboratory of plant pathology. The guiding hand of real genius was evident in every detail of the multitude of activities carried on there, touching as they did upon all phases of the science which he had advanced more than any other man.

Dr. Smith was almost an ideal representative of that type of inspired scientist who could suppress all desire for worldly advancement in order to devote all of his physical resources and his splendid intellectual equipment to the attainment of scientific truth. His home life as judged by the luxurious standards of modern conduct was almost ascetic in its simplicity, his books, the tools of his trade and the other accessories of scientific research being the only items of considerable expense which he never denied himself. He spared no outlay for these things and surrounded himself with them to have at hand the necessities for uninterrupted study during what would ordinarily be the hours of leisure. An interesting commentary on Dr. Smith's evaluation of the requirements for the type of life he led is found in the fact that his modest home was illuminated in the style of the past generation and that in this day of universal transportation on rubber tires he preferred to walk. Only during the last few weeks of his life, when he must have felt his physical powers waning and undoubtedly had a premonition that conservation of his strength was essential, did he make use of taxicabs to convey him to and from the laboratory.

This unusual man never allowed himself to be drawn into the purely social functions which only too often are the tribute levied by the idle upon the time of the workers of the world. He knew the necessity

for conserving his energy for the great work to which he had dedicated his life and his daily routine of working, eating and sleeping was planned with the utmost care to permit a concentration of his magnificent mental equipment upon the daily attack on his research problems. Some fifteen years before his death, Dr. Smith discovered that two sparing meals per day were sufficient to sustain him at the maximum efficiency and he rigidly adhered to this practice until the end. While his abstemiousness was not forced upon the attention of others, it is noteworthy that he never used tobacco or intoxicants. An almost perfectly ordered life enabled him to carry on with increasing effectiveness far beyond the time when most Americans are forced to submit to the inevitable penalty for too strenuous and ill-planned application to their tasks.

The personal appearance of Dr. Smith, especially his face with full white beard, was striking. His countenance was easily recognizable as that of a scholar, full of reflective force and studious determination. The expression of benign good humor which generally characterized him was fully justified by a helpful, kindly disposition. Especially was he unfailing in extending help and advice with patient courtesy to students who sought his laboratory to take advantage of the opportunity for improvement in their methods and point of view by contact with one of the greatest exponents of the young science of plant pathology. No one who was able to convince Dr. Smith of his sincere interest and intelligent grasp of his problems was ever denied full and complete liberty to study the methods of work in the laboratory where standards of technique in plant pathological investigations were so largely developed. Foreign students, of whom an unending stream came from Europe and Japan to the laboratory of plant pathology, some of them for prolonged visits, were assured of a hearty welcome and courteous treatment during their sojourns. Evidence of the generosity of his spirit is not confined to extending aid and stimulation to scientists in these purely intellectual associations, but many times he rendered assistance of a more substantial sort when the need arose.

His scientific attainments, which are well known to the world, open up the almost inexhaustible topic of Dr. Smith's traits of character. Early in life he had shown great determination in wringing an education from an unsympathetic world in the face of discouraging obstacles. It was necessary for him to find employment to earn means for attending both high school and college, and he did not graduate from the University of Michigan until he was thirty-two years of age. The quality of persistence despite handicaps, however great, enabled him to complete difficult assignments with marked success after he was appointed to the Department of Agriculture in 1886, the year of his graduation. A masterful experimentalist and an indefatigable worker, his early work in the department soon attracted attention. All his researches, brilliantly conceived and executed, were marked by a thoroughness that left no room for disagreement with his results. He soon established a reputation for complete accomplishment and very rarely were his researches marred by premature or conjectural conclusions. Vague conceptions and baseless speculations that so often obscure explorations of the unknown are not to be found in his clear-cut contributions. Notwithstanding, he found himself at times confronted with hostile skepticism, notably the antagonism of the distinguished German scientist, Alfred Fischer, who maintained purely on *a priori* grounds that the tissues of growing plants were an environment unsuited to the growth and development of bacterial organisms. By his complete and convincing refutation of this viewpoint, Dr. Smith extended his reputation beyond the limits of the United States and became the acknowledged international leader in the field of bacterial diseases of plants. In his later years, after his work on crowngall had led him to note the remarkable analogy between plant and animal overgrowths, it was evident that he was eager to pursue to an ultimate conclusion the question of possible bacterial causation in connection with one of the world's greatest unsolved problems, that of human cancer. In advancing this work he attracted the attention of medical experimentalists and stimulated research that may serve to finally elucidate the origin of this dreaded disease. Consistent with his usual caution in not accepting results unless adequately repeated and with the most rigid scrutiny of methods, he was intensely interested but not carried away when it was announced late in 1925 from Dr. Blumenthal's laboratory in Berlin that an organism isolated from human breast cancer had produced tumors when inoculated into plants and rats. The possible identity of the organism causing plant and animal tumors was apparently never in his mind, but the remarkable similarity in ontogeny and structure of the various types of overgrowths in the plant and animal kingdoms convinced him that the animal tumor, as he had proved with the analogous plant tumor, is originated by infection with a parasitic organism. In common with all of his scientific endeavors this work typifies his zeal in the service of mankind, the conservation of food crops or the alleviation of human suffering having been always uppermost in his thoughts and in fact to him was the principal justification for his existence. Whatever may be the outcome of his venture into the field of animal pathology, his place in the annals of the science of

plant pathology which he helped to elevate to a profession of high standing will endure for all time. In this line of endeavor nature's obedient response to his interrogations is well evidenced by a survey of the astonishing number of publications he has contributed, 167 original and 73 reviews, a total of 240.

It is not necessary to say to the friends of Dr. Smith that his culture was far more than plant pathological. An inherent love of the more refined embellishments of our civilization, especially literature, served to further distinguish this many-sided man. A patron of all the arts, he was a master of lucid composition and a gifted poet. A book of verse published privately in 1915, containing 197 sonnets and other original poems, together with understanding and sympathetic Latin translations from the German, French and Italian languages, is an achievement of his creative ability, practically unknown except to the small circle of friends among whom the limited edition was circulated. His fondness for the beautiful city of his adoption was not confined to a detached admiration of its charm. As a member of the Arts Club of Washington he actively served with the enthusiastic and disinterested groups of public-spirited citizens in movements designed for preserving its natural beauty and enhancing it with architectural adornments in keeping with the vision of L'Enfant.

A glimpse into his home disclosed a veritable treasure house of art objects and a superlative library selected with discriminating taste during a long lifetime of profound meditation on the serious things of this life and the hereafter. Dr. Smith was not a churchman in the sense of regular display of piety, but he was deeply religious and his faith as revealed in his written records constitutes an answer to the challenge of the fundamentalists who see in the interpretations of science an undermining of the structure of Christianity.

At a time when he could look back over the course of a long life rich in service to his fellowmen and just following the spontaneous tribute to his genius by his fellow scientists at the Philadelphia meetings of the American Association for the Advancement of Science he passed into the state which can not be voiced more fittingly than in his own words:

QUIETUDE: A PRAYER

God of all flesh, when these my days are sped
Let me but hear the music of the spheres
Or see, far off, the progress of the years
And I shall be greatwhile content though dead;
For to their heavenly music I am wed
And thrill with subtile thrills, nor yield to fears.
Thy great To-morrow wipes away all tears
And there, as here, Thy law shall be our bread.
Then let me dwell in some great quiet place
Where I may brood in peace on time's deep things
And all the mystery that round man clings;
Far off, mayhap, have glimpse of one sweet face;
And catch the tones of twanging golden strings
Whereto Thy myriad million stars keep pace!

E. W. BRANDES

UNITED STATES DEPARTMENT
OF AGRICULTURE

COLLEGE LIBRARIES AND CHEMICAL EDUCATION

WHETHER we would have it or no, the purpose of the small college is changing. A decade ago the graduate of a college was thought to be fitted with the requisites of a cultural, liberal education, to be ready to begin his life work as a good citizen. Within a generation, however, has come an era of specialization. Everywhere we see the demand for the expert worker, the professional man who has devoted from two to four additional years to train himself in a special way in a particular field.

The small college has stood staunch in its desire to supply the liberal education and perhaps it has done well in maintaining this position. On the other hand, many of the large universities have shifted the emphasis from undergraduate work to graduate study. Still others have tried to develop both side by side. Few of the small colleges have kept astride with the inevitable consequences of such a situation. The few who have are sending an increasing number of their graduates to these universities to complete their training. As an example of this, it is the boast of Pomona College that over seventy per cent. of her graduates have taken subsequent professional training. It has become the evident duty, therefore, of the small college to prepare its men, not only to enter such graduate schools, but also to meet successfully the ever-increasing intensity of competition found there. This in addition to supplying a broad cultural education. This duty has brought with it a number of problems of first magnitude. One of the biggest of these is the problem of adequate library facilities.

It is the purpose of this paper to discuss this problem with special reference to the student whose college major is chemistry. The answer to the question of what books a library in chemistry should contain will be found excellently answered in a book, containing a list of 1,600 books, each one judged by experts as to importance and value. This book, edited by Patterson and Crane, will soon be available. The problem of the purchase of new books as they appear is one which must be answered anew for each

volume and can hardly be discussed in a paper of this kind. Fortunately, perhaps, the question of books is a minor part of the principal problem, and is almost totally eclipsed by the bigger question: What files of scientific periodicals are needed in a college library successfully to prepare the student for advanced work, taking into consideration also those materials necessary for the stimulation and intellectual development of the faculty? This latter need is quite as important as the first because of the increasing demand of the colleges for instructors with the doctorate degree. Such men are reluctant to accept positions in colleges where facilities for continuing the research which they have learned to love are lacking.

One way to answer this question would be merely to sit down and compile a list of those journals which one considers indispensable. Such a procedure might prove eminently successful in certain cases, but it seems reasonably certain that often the result would be seasoned too much by the needs, likes and dislikes of the compiler. In casting around for a better method of arriving at the answer, the writers decided to seek an arbitrary standard of some kind by which to measure the desirability of purchasing a particular journal.

If one grants, to avoid argument, that the department is trying to train men, first, to understand the science of chemistry (including, of course, the methods and means of advancing the frontiers of the science) and, second, to be able actually to contribute to this progress, then it seems inquiry should be made into the library tools which men are using who are now doing just this. With this purpose in mind, it was decided to tabulate the references in a single volume of *The Journal of the American Chemical Society*. This journal was chosen as the most representative of American chemistry. It is believed that the results of such a tabulation can be considered statistically and used with certain reservations to predict the future needs for a period, let us say, of ten years. The most recent complete volume (1926) of this journal has been chosen and the results tabulated in such a way that the relative importance of any single periodical for any five-year period can be seen. This is very important when one considers that only relatively few libraries can afford complete files of journals which have been published continuously for a century or more.

TABLE I

	Total	1921–1925	1916–1920	1911–1915	1906–1910	1901–1905	1896–1900	1891–1895	1886–1890	1881–1885	1876–1880	1871–1875
Ber.	686	78	30	67	115	79	64	60	56	53	44	33
J. Chem. Soc.	390	122	37	60	45	47	21	20	5	2	1	—
Ann.	278	26	8	37	33	23	22	21	19	18	13	—
Z. physik. Chem.	191	53	6	21	29	19	28	16	6	—	—	—
Compt. rend.	126	26	3	23	15	23	15	21	7	9	8	—
J. Phys. Chem.	93	42	13	13	5	1	1	—	—	—	—	—
Ann. Physik	93	18	4	28	13	6	0	0	6	5	2	—
J. Biol. Chem.	80	41	16	14	7	—	—	—	—	—	—	—
Am. Chem. J.	70	—	—	9	21	20	14	8	4	2	1	—
Z. anorg. Chem.	68	21	11	5	8	11	6	2	—	—	—	—
Ann. Chim.	68	5	0	6	9	7	3	5	1	8	4	2
Bull. Soc. Chim.	60	16	3	4	7	10	4	4	3	4	2	1
Proc. Roy. Soc.	55	30	5	4	8	5	1	0	1	—	—	—
J. Ind. Eng. Chem.	53	33	10	5	1	—	—	—	—	—	—	—
Z. Phys.	51	41	5	—	—	—	—	—	—	—	—	—
Monatsch.	51	2	1	21	5	9	3	2	5	3	—	—
J. prakt. Chem.	50	6	1	2	2	6	3	12	6	6	2	2
Phil. Mag.	49	17	14	4	2	3	3	1	1	0	0	1
Gazz. chim. ital.	44	10	6	2	6	4	8	4	3	0	1	—
Phys. Rev.	44	23	8	3	5	4	—	—	—	—	—	—
Physik. Zeit.	41	26	0	7	3	—	—	—	—	—	—	—
Z. Elektrochem.	37	11	13	4	4	4	1	—	—	—	—	—
Biochem. Z.	37	18	2	9	10	—	—	—	—	—	—	—
Rec. trav. chim.	36	14	5	2	2	2	5	4	1	1	—	—
SCIENCE	27	22	3	—	—	—	—	—	—	—	—	—
Trans. Far. Soc.	24	18	0	1	0	1	—	—	—	—	—	—
Proc. Nat'l Acad.	22	19	0	—	—	—	—	—	—	—	—	—
Nature	21	13	5	1	—	—	—	—	—	—	—	—

The abbreviations used above and in the tables to follow are those accepted by *Chemical Abstracts* and may be found in their list of periodicals abstracted, issued October 20, 1926.

For the purposes of this tabulation, references to *The Journal of the American Chemical Society* have been excluded. References to the current year (1926) are not included in the tables except in the totals because of the fact that certain journals published near at hand are more readily available than others and references to the current year would, of course, be more numerous for these journals than for others. The total number of references thus considered was found to be 3,633 and these were found to be distributed among 247 different journals or periodicals. In Table I are given the results of this tabulation for the leading 28 periodicals, arranged in order of total number of references. A short study of this table will show that a large total number of references is not the only criterion of desirability which should be applied. It must be realized that a periodical which has been in existence for only ten years, having, let us say, but half as many references as one which has been published continuously for fifty years, would be more desirable, dollar for dollar invested, than the latter, assuming the cost per year to be comparable in the two cases. It is also possible that a journal may have been of such quality for a long period of years that it is now little used and that in later years its quality may have improved or the nature of its material changed in such a way that it is now a very valuable journal. The reverse change is even easier to imagine. It is for such reasons that the distribution as to years of publication of articles referred to is given after the column giving the total number of references.

The distribution of references not included in the above table is shown in Table II.

TABLE II

Number of references	Number of periodicals
15–20	7
10–14	15
5– 9	27
3– 4	37
2	33
1	99

The meaning of Table II is made clear when it is stated that there were 99 periodicals to which there was but a single reference, or that there were 27 journals to which reference was made from five to nine times each.

A third tabulation will prove valuable in deciding what journals should be included in the current library subscription lists, even though funds may not be available for the extensive purchase of back-files. In this connection, it must be realized that the "present trend" rather than the "past performance" of a journal should be considered first. In Table III the journals have been rearranged in order of number of references in the period 1916–1925 inclusive.

TABLE III

Name of Journal	No. of references 1916–1925
J. Chem. Soc.	159
Berichte	108
Z. Phys. Chem.	59
J. Biol. Chem.	57
J. Phys. Chem.	55
Z. für Physik	46
J. Ind. Eng. Chem.	43
Proc. Roy. Soc.	35
Annalen der Chemie	34
Z. anorg. Chem.	33
Ann. Physik	32
Phil. Mag.	31
Phys. Rev.	31
Compt. rend.	29
Phys. Zeit.	26
SCIENCE	25
Z. Elektrochem.	24
Biochem. Z.	20
Proc. Nat. Acad. Sci.	19
Rec. trav. chim.	19
Bull. soc. chim.	19
Trans. Far. Soc.	18

The importance of such a tabulation is realized when the relative positions of periodicals are compared in Tables I and III. For example in Table I, Liebig's *Annalen der Chemie* is third while *Zeitschrift für Physik* is in fifteenth place, while in Table III *Annalen* is ninth and the *Zeitschrift für Physik* is in sixth place. It must apparent that to the American chemist the current number of the latter journal is of more importance than a current number of the classical *Annalen der Chemie*.

The use of these tables is left to the individual reader who will know best how to adapt them to a local need. The following conclusions formulated from them by the writers may prove of assistance in making such applications.

(1) It is assumed that the first need of any American college chemistry library is a complete file of the publications of The American Chemical Society: *The Journal of the American Chemical Society, Chemical Abstracts, The Journal of Industrial and Engineering Chemistry.*

(2) The complete file of the *Berichte der deutschen chemischen Gesellschaft* is indispensable. It must

come as a surprise to many chemists, even though they were conscious of the vast number of references to this journal, that 18.88 per cent., or almost one in five, of all references are to this single journal.

(3) The file of *The Journal of the Chemical Society* (London) should begin with 1891 and be complete to date. Even though funds for back-files are not available, this journal should be included in the current subscription lists of every library. This will be realized if reference is made to Table III.

(4) The file of the *Zeitschrift für physikalische Chemie* should be complete from 1895 to date, and it should be on the current subscription lists. From its present trend of usefulness (*vide* Table III) it is believed that this journal deserves consideration before *Liebig's Annalen der Chemie*. There is another reason for placing this journal next, because by so doing the balance between organic and physical chemistry is better maintained.

(5) Next in importance, perhaps, is *Annalen der Chemie* (Liebig's). It should be borne in mind that many of the classical researches to which students studying organic chemistry should be constantly referred are found in the back files of this journal. The quality and usefulness of this journal has apparently been very uniform since its first publication. Because of this fact, the back files should begin as far back as possible. Original reprint of this journal is now almost impossible to obtain. Anastatic reprint is available, however, at not unreasonable cost. It should be remembered that such reprint when reproduced from old and time-worn original print may not be first class.

(6) Certainly no American college library of chemistry should be without *The Journal of Physical Chemistry* to-day. Apparently the quality of this periodical has been much improved recently. (See Table I.) Back files should certainly start as early as 1920 and wherever possible with 1910 issues.

(7) Next in importance, the writers place *The Journal of Biological Chemistry*. This journal should only be considered by colleges where members of the staff in chemistry or biology are interested in this field. Students looking forward to the study of medicine should be provided with this journal. Back files might well begin in 1920.

(8) Attention should be called to the recently growing importance of so-called "practical" journals for academic work. Publication of research has been at such a pace that the regular channels of publication are overcrowded. The natural result of this is that many articles of academic interest are now being regularly published in non-academic journals. An excellent example of this is found in the marked increase in usefulness, as exemplified by the number of references to it, of *The Journal of Industrial and Engineering Chemistry*. (See Table I, 1921–25.)

(9) An interesting and important corollary of this tabulation is discovered when one considers the language of publication of the references tabulated. Considering only the foreign periodicals (*i.e.*, excluding those published in the United States) the results are found in Table IV.

TABLE IV

Language	Number of references	Per cent.
German	1667	52.5
English	1119	35.2
French	300	9.4
All others	87	2.8

Certainly it should be insisted that a reading knowledge of German be required of every student majoring in chemistry in college. French can hardly be accepted as a substitute although it should, of course, be urged as a complementary tool of value.

(10) The conclusions which precede have been drawn from a consideration of periodicals which are strictly chemical in their subject matter. Due to the rise of physical chemistry during the last decade, there are an increasing number of journals usually considered in the domain of physics which must be considered as important for a chemistry student. This fact must not be lost sight of in the expenditure of library funds. The following journals which come in this class are of prime importance to the chemist and might well be considered jointly by the departments of physics and chemistry: *Annalen der Physik, Zeitschrift für Physik, Physical Review, Physikalische Zeitschrift* and *Transactions of the Faraday Society*.

(11) There is also a group of periodicals of even wider interest than the group immediately preceding. These might well be considered by the entire science division of the college faculty, as material of interest in astronomy, biology, chemistry, geology, mathematics, physics, etc., is included. The list follows: *Philosophical Magazine, Comptes rendus de l'academie des Sciences,* SCIENCE, *Nature, Proceedings of the National Academy of Sciences* and *Proceedings of the Royal Society* (London).

Perhaps the writers have not succeeded in answering the general question which they set for themselves at the outset of this survey. Perhaps, however, they have succeeded in pointing the way in which this question may be more readily answered by

chemists, who may profit by the data here tabulated. Perhaps, also, the way has been pointed for workers in fields other than chemistry to answer this question for themselves. If this partial success has been achieved, the time and labor expended in this study will have been amply repaid.

P. L. K. GROSS
E. M. GROSS

DEPARTMENT OF CHEMISTRY,
POMONA COLLEGE

SCIENTIFIC EVENTS

ZOOLOGY AT THE NASHVILLE MEETING OF THE AMERICAN ASSOCIATION

THE American Society of Zoologists and section F (zoology) of the American Association for the Advancement of Science will hold joint sessions for the reading of papers at Nashville from Wednesday, December 28, to Friday, December 30, inclusive. The Hermitage Hotel, Sixth Avenue and Union Street, will be headquarters for members of both organizations; the stated price for single rooms is $2.50 to $5.00. Those planning to attend the meetings are strongly advised to write direct to the hotel and make reservations as early as possible, since it may not be possible to accommodate all.

On Wednesday evening will be held a biologists' smoker; on Thursday evening the zoologists' dinner; and on Friday evening the naturalists' dinner; all in the Hermitage Hotel. At the zoologists' dinner, Thursday evening, Professor W. C. Curtis, retiring vice-president of section F, will deliver his address on the topic, "Old Problems and New Technique." Sessions for the reading of papers will be held in the school of medicine, with ample provision for meetings and for demonstrations.

Members of section F, not members of the American Society of Zoologists, who desire to read papers, should submit titles accompanied by abstracts not exceeding 250 words. These may be sent to the secretary of section F at the address subscribed to this notice any time before November 12, or they may be sent direct to the secretary of the American Society of Zoologists, D. E. Minnich, department of zoology, University of Minnesota, any time before November 15. Papers will not be received by the secretaries after these respective dates. The maximum time allowed for the presentation of a paper is fifteen minutes. The American Society of Zoologists has charge of the program and arrangements.

General announcements regarding the matters of transportation, housing and the like, will be found in the preliminary statement of the permanent secretary of the American Association for the Advancement of Science, soon to be published.

GEO. T. HARGITT,
Secretary, Section F

LYMAN HALL, SYRACUSE UNIVERSITY,
SYRACUSE, N. Y.

THE INTERNATIONAL OFFICE OF CHEMISTRY AT PARIS

THE American Chemical Society has addressed a letter to the Secretary of State, Frank B. Kellogg, stating its opposition to American membership in the International Office of Chemistry at Paris, to which an invitation to membership has been received from the French government.

The letter to Secretary Kellogg, made public by the secretary of the society, Charles L. Parsons, states that the invitation of the French government is still before the department for consideration. The Department of State, however, in commenting upon the letter October 18, stated that the invitation of the French government was received on June 1, 1926, and that a reply had been sent August 12, 1926, that the "United States Government had reached the opinion that the compensatory advantages that would accrue to it through membership in the International Office of Chemistry were not sufficient to warrant the United States Government in becoming a member of the office at this time."

The full text of Dr. Parsons' letter follows:

HON. FRANK B. KELLOGG,
The Secretary of State,
Washington, D. C.

Sir: By vote of the council of the American Chemical Society, I was requested to call your attention officially to the enclosed October 10 issue of the News Edition of the official organ of our society.

The American Chemical Society has in its organization practically all of the prominent and influential chemists of America and a membership of approximately 15,400.

We would respectfully request that, before any action is taken by the United States toward participating in the International Office of Chemistry which is still before your department on proposal of the French Republic, careful consideration be given the facts and data presented in this publication.

The American Chemical Society is very strongly opposed to the creation of any international center for the control of chemistry, whether it be located in France or elsewhere. We would, accordingly, request that this communication and this publication be duly filed with the proposals which have been received from the French Government covering the International Food Laboratory and an International Office of Chemistry.

LECTURES AT THE FIELD MUSEUM OF NATURAL HISTORY

A SECOND series of ten free lectures on science and travel, illustrated with moving pictures and stereopticon slides, to be given at Field Museum of Natural History this autumn and winter, has been announced by D. C. Davies, director of the museum. All lectures will be given in the James Simpson Theater of the museum, and begin at 3 P. M., and are open to the general public.

Following are the dates, subjects and lecturers for the new series:

Nov. 6.—*The depths of the sea.* Dr. Raymond L. Ditmars, curator, New York Zoological Park.

Nov. 13.—*The Captain Marshall Field Brazilian expedition of 1926.* George K. Cherrie, leader of the expedition.

Nov. 20.—*Abyssinia.* (The Field Museum-Chicago Daily News expedition to Abyssinia.) Dr. Wilfred H. Osgood, curator of zoology, leader of the expedition.

Dec. 4.—*Beneath tropic seas.* Dr. William Beebe, director of tropical research, New York Zoological Society.

Dec. 11.—*Adventures, archeological and otherwise, in Arabia, Egypt, the Sudan, Sinai, Transjordania, Palestine and Syria.* Lowell Thomas, author and traveler.

Jan. 14.—*Birds and animals of Alaska.* William K. Finley, director of wild life conservation, State of Oregon.

Jan. 15.—Same lecture as Jan. 14.

Jan. 22.—*The way of the sperm whaler.* Dr. Robert Cushman Murphy, American Museum of Natural History.

Jan. 28.—*Explorations in plant life.* Arthur C. Pillsbury.

Jan. 29.—*The Malay Peninsula.* Carvoth Wells.

The general public is invited to these lectures. Members of Field Museum may reserve seats for themselves.

The five Saturday lectures of the first series remaining to be given are as follows:

Nov. 5.—*The depths of the sea.* Dr. Raymond L. Ditmars, New York Zoological Park.

Nov. 12.—*The Captain Marshall Field Brazilian expedition of 1926.* George K. Cherrie, leader of the expedition.

Nov. 19.—*Explorations at the North Pole of the winds.* Professor William H. Hobbs, leader, University of Michigan Greenland Expedition.

Nov. 26.—*Sun dance of the Blackfoot Indians.* Walter McClintock, Pittsburgh.

Dec. 3.—*The wonders of marine life.* Dr. William Beebe, New York Zoological Society.

DEDICATION OF THE NEW MEDICAL LABORATORIES AT THE UNIVERSITY OF CHICAGO

FORMAL opening of the university clinics and new medical laboratories at the University of Chicago will take place on October 31 and November 1. On these dates special convocation and dedicatory exercises will be held, which will include the following clinics and addresses:

Medicine and the university: JAMES ROWLAND ANGELL, president of Yale University.

Reduction of dyes by biological systems and some remarks on the mechanism: W. MANSFIELD CLARK, professor of physiological chemistry, the John Hopkins Medical School.

The regulation of respiration: ROBERT GESELL, professor of physiology, the University of Michigan.

Studies in drug tolerance, with special reference to the esters of nitrous and nitric acids: ARTHUR S. LOEVENHART, professor of pharmacology, the University of Wisconsin.

Some recent investigations on antigens: KARL LANDSTEINER, member of the Rockefeller Institute for Medical Research.

Medicine and science: ALFRED E. COHN, member of the Rockefeller Institute for Medical Research.

Urea excretion in nephritis: DONALD D. VAN SLYKE, member of the Rockefeller Institute for Medical Research.

Clinical demonstrations: ARTHUR DEAN BEVAN, professor of surgery, Rush Medical College of the University of Chicago.

The non-excretory functions of the kidney: I. SNAPPER, professor of pharmacology and general pathology, the University of Amsterdam.

The present status of cancer research: FRANCIS CARTER WOOD, director of the Institute of Cancer Research, Columbia University.

The hospital and the laboratory: RUFUS COLE, director of the hospital of the Rockefeller Institute for Medical Research.

Bacterial endocarditis: WILLIAM S. THAYER, professor emeritus of medicine, the Johns Hopkins Medical School.

Diseases of the gall bladder: EVARTS AMBROSE GRAHAM, professor of surgery, Washington University School of Medicine.

In the group of five buildings, one for physiology, pharmacology and physiological chemistry, one for pathology, one for the medical clinic and one for the surgical clinic, there is an administration building in which are placed many services that will be used in common. Near by are the laboratories for the premedical sciences and for the underlying sciences in medicine that are not included in the new medical group.

Hospital and out-clinic service is now available at the university in general medicine, surgery, eye, nose and throat and neurology. The new building on the Midway of the Chicago Lying-In Hospital, affiliated with the university, will provide for obstetric cases at a later date. The Charles Gilman Smith Memorial Hospital, to be built soon, will care for contagious diseases; the Bobs Roberts Memorial Hospital, for children; and the Gertrude Dunn Hicks Memorial, for

thopedic surgery. The Chicago Lying-in Hospital now engaged in raising the last $400,000 of the ,000,000 required for its funds, and gifts have already provided for the construction of the other hospitals.

The service of the University of Chicago clinics is available to all classes of patients, with special provision for persons of restricted means in both the outpatient department and the hospital. The clinics contain 6,660,600 cubic feet of space—one third of the total of all university buildings. The medical school of the university now represents an investment of twenty million dollars, seven millions in the buildings and thirteen millions in endowments.

THE BUREAU OF ENTOMOLOGY AND DR. L. O. HOWARD

AFTER more than thirty-three years of service as chief entomologist of the United States Department of Agriculture, Dr. Leland O. Howard retired on October 17 as the chief of the Bureau of Entomology, and was succeeded by Dr. C. L. Marlatt, a member of the department since 1888 and who for the past five years has been associate chief in charge of the regulatory work of the bureau, and also chairman of the Federal Horticultural Board.

Dr. Howard is now in his fiftieth year of government service, having joined the entomological branch of the Department of Agriculture in 1878, soon after his graduation from Cornell University. He retires as chief at his own request, but this does not mean retirement from service. He has passed his seventieth birthday, and has asked to be relieved of the administrative duties of his office, but proposes to devote his full energies to the field of entomological research, in which he has long been recognized as a most distinguished investigator. His special fields are medical entomology and parasitology.

Dr. Howard was placed in charge of the entomological work of the department on June 1, 1894. In the thirty-three years that have followed, the science of entomology has greatly broadened and Dr. Howard has guided numerous activities which have been of great service to the American public.

Two campaigns with which Dr. Howard has been identified are especially widely known. He was a leader in the mosquito crusade. As early as 1892 he published results of experiments showing that certain types could be controlled by the use of kerosene, and when the mosquitoes were identified as disease carriers he was able to recommend methods of control. His publications on the house-fly dating from 1896 to his book "The House-Fly Disease Carrier" in 1911, were largely responsible for the anti-house-fly crusades all over the world in the last twenty years.

Dr. Howard is a member of the National Academy of Sciences, the American Philosophical Society, and the American Academy of Arts and Sciences. He was permanent secretary of the American Association for the Advancement of Science for twenty-two years, and its president in 1920–21. He has been made honorary member of many foreign scientific societies and is the only American honorary member of the Academy of Agriculture of France, and received several decorations, among which are the Cross, Chevalier de la Légion d'Honneur, and the Cross, Officier de l'Ordre du Mérite agricole. He has been a delegate to many international assemblies and an officer of six scientific gatherings. In addition to bachelor's and master's degrees from Cornell, his doctorates include Ph.D. (Georgetown, 1896), M.D. (George Washington, 1911), LL.D. (Pittsburgh, 1911), and Sc.D. (Toronto, 1920). The bibliography of his publications includes 941 titles.

Dr. Marlatt, who succeeds Dr. Howard, joined the Department of Agriculture in 1388 and has been closely associated with Dr. Howard's administration. When Dr. Howard was made chief Dr. Marlatt became assistant chief, and in 1922 associate chief in charge of regulatory work. He was instrumental in promoting the passage of the plant quarantine act of 1912 and was appointed to administer it. Dr. Marlatt's specialities have been studies of scale insects, sawflies and periodical Cicadas, known as locusts.

Dr. Marlatt holds the degrees of B.S., M.S. and D.Sc., all from the Kansas State Agricultural College.

SCIENTIFIC NOTES AND NEWS

DR. HOMER LEROY SHANTZ, for the past year head of the department of botany at the University of Illinois and previously senior physiologist in the U. S. Bureau of Plant Industry, has been elected president of the University of Arizona, his appointment to be effective in September, 1928. Dr. Byron Cummings, head of the department of archeology, who has been acting president since the resignation of Dr. C. H. Marvin last February, has been named president of the university for the present year.

THE John Fritz gold medal of the Engineering Foundation has been awarded to General John J. Carty, vice-president of the American Telephone and Telegraph Company, in recognition of having "done more than any other man toward the development of modern telephone engineering."

THE Leslie Dana gold medal, awarded annually to the person who has done most for the conservation of vision during the preceding year, was presented on October 18 to Dr. Lucien Howe, of Buffalo.

DR. WILLIAM LISPENARD ROBB, dean of electrical engineering at Rensselaer Polytechnic Institute, Troy, N. Y., has been awarded a 35-year service medal by the Hartford Electric Light Company, having entered the service of the company in 1892 in an advisory capacity and continuing to perform this service.

DR. JOHN M. T. FINNEY, professor of clinical surgery of the Johns Hopkins University School of Medicine, Baltimore, will be guest of honor of the Medical Club of Philadelphia on October 28 at a reception at the Bellevue-Stratford Hotel.

DR. JOHN STEWART, dean of the faculty of medicine at Dalhousie University, celebrated the fiftieth anniversary of his graduation on October 6, when a dinner was given in his honor in the Halifax Hotel. During the dinner Dean Stewart was presented with an address and a purse of gold.

DR. KARL SICK, professor of surgery at Hamburg University, has been nominated an honorary professor by the Turkish government for his help in the organization of medical education in Turkey.

AT the International Dental Congress recently held at Copenhagen the executive committee awarded the Miller prize, founded in 1910, to Professor Wilhelm Dieck, director of the Dental Institute of the University of Berlin.

THE University of Rome has conferred on Professor Fernando Perez, ambassador of Argentina to the king of Italy, the degree of doctor of medicine and surgery *honoris causa*.

AT the annual meeting of the trustees of the Mt. Desert Island Biological Laboratory the following officers were elected: Dr. Hermon Carey Bumpus, *president;* Professor Duncan S. Johnson, *vice-president;* Mrs. Louise DeKoven Bowen, *treasurer;* Dr. H. V. Neal, *secretary*. Dr. Neal was reelected director of the laboratory.

AT the meeting of Sigma Xi at the University of Virginia on October 17, the officers for the year 1927–28 were elected as follows: Wilbur A. Nelson, professor of geology and state geologist of Virginia, *president;* L. G. Hoxton, department of physics, *vice-president,* and Bruce D. Reynolds, department of biology, *secretary-treasurer*.

DR. IRVING CUTTER, dean and associate professor of medicine, Northwestern University Medical School, was elected president of the Phi Rho Sigma Medical Fraternity at the fifteenth biennial convention in Montreal from September 14 to 17.

DR. FREDERICK P. GAY, professor of bacteriology at the College of Physicians and Surgeons, Columbia University, has been made a member of the commission appointed to make a world survey of epidemic encephalitis.

LAURENCE LA FORGE has resigned as geologist in the U. S. Geological Survey.

WILLIAM G. HOUSEKEEPER has resigned from the technical staff of the Bell Telephone Laboratories, Inc., of New York, N. Y.

ELMER O. KRAEMER has resigned from the assistant professorship in colloids, which he held at the University of Wisconsin, and has joined the staff of the Experimental Station of E. I. du Pont de Nemours and Co., Wilmington, Del.

S. F. SCHAIRER, graduate student in the department of chemistry at Yale University, has joined the staff of the geophysical laboratory, Carnegie Institution of Washington.

PROFESSOR WILLIAM M. CLAY, of the biology department of Transylvania University, Lexington, Kentucky, has been appointed curator of the Transylvania Museum of Natural History.

W. A. MATHENY has been appointed director of the University of Ohio Museum.

SIDNEY B. HASKELL, director of the Massachusetts Agricultural Station and acting head of the division of agriculture at the Massachusetts Agricultural College, has resigned. He will assume a position with private interests in New York City.

M. BARRY WATSON has resigned from the position of director of engineering in the Toronto Technical Schools and is entering consulting practice.

THE staff of the University of Michigan Southern Observatory in South Africa has been increased by the addition of Mr. Morris K. Jessup and Mr. Henry F. Donner, who will assist Professor Richard A. Rossiter there in the study of double stars.

DR. ANDREW W. SELLARDS, assistant professor of tropical medicine at the Harvard Medical School, has been granted leave of absence for the academic year 1927–28 and will go to West Africa to make a study of yellow fever and other tropical diseases.

CHARLES W. CUNO has resigned his position at Washington University, St. Louis, Mo., and is to be at Göttingen, Germany, for the coming year as visiting professor, lecturing on "American Practice in Industrial Chemistry and Metallurgy."

DR. CHARLES L. SWISHER, professor of physics at the North Dakota Agricultural College, has been granted a leave of absence for the coming year, in

order to fill an appointment of assistant professor of physics at Yale University.

IN response to invitations from the International Office of Museums and the British Royal Commission on Museums, Laurence Vail Coleman, director of the American Association of Museums, sailed for Europe on October 15.

DR. C. G. ABBOT, of the Smithsonian Institution, has returned to Washington after the summer's field-work at Mt. Wilson, California.

DR. EUGENE R. WHITMORE, professor of parasitology and pathology at Georgetown University medical and dental schools, returned to Washington in time to take up his class work on the opening of school, after spending the summer in the West Indies and Central America studying malaria and blackwater fever.

PROFESSOR C. T. BRUES, of the Bussey Institution, Harvard University, has returned from an excursion into Nevada, Utah and eastern California, where he spent the summer in an investigation of the fauna of the hot springs in this region. He was accompanied by Mrs. Brues, who made observations on the grass flora associated with the thermal springs, and by their son, who secures data on the characteristics of the thermal waters.

C. E. RESSER and R. S. Bassler, of the department of geology, U. S. National Museum, have returned from two months' field-work in the Rocky Mountain region of both the United States and Canada, where they obtained certain stratigraphic information necessary to complete an extended work upon the region by Dr. Charles D. Walcott.

DR. M. O. MALTE, chief botanist of the National Museum, Canadian Department of Mines, who accompanied the 1927 expedition to the Canadian Arctic archipelago, has returned with a large collection of botanical material.

W. F. FOSHAG and HARRY BERMAN have completed a trip to mining districts in northern Mexico, conducted under the auspices of the U. S. National Museum and the mineralogical museum of Harvard University, for the purpose of collecting exhibition specimens of the minerals of the region.

DR. JEAN DUFINOY, of Arcachon, France, has been sent to Cornell University by the Rockefeller Foundation for special study in the department of plant pathology.

DRS. PAUL ALEXANDROFF (Moscow) and Heinze Hopf (Berlin), holders of International Education Board fellowships for 1927–28 for the purpose of becoming acquainted with the work of American mathematicians in the field of analysis situs, are now at Princeton University and will go to Harvard University later.

DR. PAUL WALDEN, professor of chemistry at the University of Rostock, holder of the George Fisher Baker non-resident lectureship in chemistry this term at Cornell University, opened his course on October 5 with a discussion of modern chemistry's relation to ancient alchemy.

PROFESSOR ALEXANDER SILVERMAN, head of the department of chemistry of the University of Pittsburgh, gave an illustrated lecture on "Glass" before the Akron Section of the American Chemical Society on September 29.

DR. RAOUL BLANCHARD, professor of geography in the University of Grenoble, France, lectured on October 19, at Columbia University, under the auspices of the Institute of Arts and Sciences.

PROFESSOR GARWOOD, F.R.S., gave his presidential address, "The Development of River Meanders," to the Westminster and Central London branch of the Geographical Association on October 12, at University College.

SIR JOHN ROSE BRADFORD, president of the Royal College of Physicians, will deliver an introductory address on "The Study of Medicine" at the opening of the winter session of the Durham College of Medicine, Newcastle-on-Tyne, on October 11.

FRIENDS and colleagues of the late Professor Adrian Stokes have decided to establish a memorial in recognition of the man and his work, through the establishment of a Stokes research fellowship or studentship, at the medical school of Guy's Hospital, London.

THE Helminthological Society of Washington, of which Eloise B. Cram is president and Mabelle B. Orkman corresponding secretary, has passed the following resolution: "The members of the Helminthological Society of Washington learn with profound regret of the death of Dr. Henry J. Nichols. His death is a distinct loss to science and medicine, in which fields he was a distinguished and able worker, as well as the loss to us of a highly esteemed friend. We extend our sincere sympathy to his family in their bereavement and to the Army Medical Corps in the passing of a beloved comrade."

DR. FREDERICK CHARLES NEWCOMBE, professor emeritus of botany and former head of the department of botany at the University of Michigan, died in Honolulu, T. H., on October 1, aged sixty-nine years. Dr. Newcombe was taken ill aboard ship while return-

ing from a trip to the mainland and died the morning after arrival in Honolulu.

PROFESSOR PERLEY F. WALKER, dean of the school of engineering of the University of Kansas since 1913, committed suicide on October 17. Dr. Walker was fifty-two years of age.

DR. FRANK SHEARMAN MEARA, professor of clinical medicine at the Cornell University Medical College, died on October 9, aged sixty-one years.

IT is announced from the Carnegie Institute of Technology in Pittsburgh that a second International Conference on Bituminous Coal will be held there during the week of November 19, 1928. Decision to call a second congress of world scientists and fuel technologists has been made as a result of the interest aroused by the first conference on bituminous coal held at the institute in November, 1926. Although no definite program plans for the second conference have been made, it is expected that the session will cover the latest developments in obtaining substitutes for gasoline from coal, power from coal, low and high temperature distillation processes, smokeless fuel, gasification of coal, utilization of coal tar products, coal as a source for fertilizer and coal in relation to the production of fixed nitrogen. Dr. Thomas S. Baker, president of the Carnegie Institute of Technology, who called the first conference, visited Europe this past summer for the purpose of discussing phases of the second conference with eminent scientists in France and Germany. He plans to pay another visit to Europe in 1928 to invite speakers and delegates.

MEMBERS of the American Association of Variable Star Observers met on October 22 at the Harvard College Observatory for their sixteenth annual meeting. Miss Alice H. Farnsworth, of Mt. Holyoke College, vice-president, presided. The president, C. C. Godfrey, of Stratford, Conn., died in August. It was announced that he had left all his astronomical instruments to the association. The council elected D. B. Pickering, of East Orange, N. J., *president,* and reelected Miss Farnsworth, *vice-president,* Mr. Olcott, *secretary,* and M. J. Jordan, of Boston, *treasurer.*

UTILIZATION of cut-over lands for reforestation will be discussed at a conference of business interests of the country called under the auspices of the U. S. Chamber of Commerce on November 16 and 17. Possibilities of using the 29,000,000 acres of forest area in the Middle Atlantic region in order to assure the industrial East a continuous source of wood supply from its own natural resources will be considered. The meeting, the first of its kind to be held, will bring together representatives from all sections of the country.

AT the International Congress of Plant Sciences (Fourth International Botanical Congress) held at Ithaca, New York, in August, 1926, an invitation was conveyed from British botanists for the fifth International Botanical Congress to be held in England in 1930. The invitation was accepted by the botanists assembled at Ithaca, and arrangements are now being made for the congress to be held at Cambridge about the middle of August, 1930. The *Journal* of the New York Botanical Garden states that an executive committee has been formed to make arrangements for the congress, consisting of Dr. F. F. Blackman, Professor V. H. Blackman, Dr. E. J. Butler, Professor Sir John Farmer, Professor F. E. Fritsch, Professor Dame Helen Gwynne-Vaughan, Dr. A. W. Hill, Professor W. Neilson Jones, Sir David Prain, Dr. A. B. Rendle (treasurer), Professor A. C. Seward (chairman), Professor W. Stiles and Professor A. G. Tansley. It has been decided to organize the congress in the following seven sections: Morphology (including anatomy), paleobotany, plant geography and ecology, taxonomy and nomenclature, genetics and cytology, physiology and mycology and plant pathology. Mr. F. T. Brooks, the botany school, University of Cambridge, England, and Dr. T. F. Chipp, Royel Botanic Gardens, Kew, England, have been appointed honorary secretaries of the congress, and any communications with regard to the congress should be addressed to one or other of the secretaries.

THE courses of lectures at the Royal Institution during November and December will begin on November 1 with the annual course of three Tyndall lectures, which will be delivered by Sir Herbert Parsons on the subject "Light and Sight." These will be followed on November 22 by four lectures by Sir William Bragg on "A Year's Work in X-ray-crystal Analysis." Mr. James Kewley will give two lectures on "Petroleum Natural Gases and their Derivatives." The Saturday lectures will include two lectures by Dr. F. J. M. Stratton on "Recent Developments in Astrophysics." The 102nd course of Christmas lectures for juveniles will be delivered by Professor E. N. da C. Andrade on "Engines," beginning on December 29.

THE auxiliary yacht *Carnegie,* a ship that has very little iron or steel in its construction and is almost totally non-magnetic, left New York on October 12 under tow for Washington, where preparations for the seventh scientific cruise will be completed. The boat, which is owned by the Carnegie Institution, will leave next May on a three-year trip which is expected to cover all the oceans of the world, collecting data on ocean currents, magnetic phenomena and similar subjects.

CASH prizes totalling $6,000 are being offered to freshmen in American colleges for essays on subjects related to chemistry by the American Chemical Society, with the endorsement of Mr. and Mrs. F. P. Garvan, of New York City. The essays must be on the relation of chemistry to health and disease, to the enrichment of life, to agriculture or forestry, to national defense, to the home or to the development of an industry. A contestant may submit only one essay and this must not exceed 2,500 words in length. The essays must be handed in to the Secretary, Committee on Prize Essays, American Chemical Society, 85 Beaver Street, New York City, before March 1, 1928.

THE first exhibition of material collected by the recently returned John Borden-Field Museum Expedition to Alaska is now open to the public at Field Museum of Natural History. The exhibit consists of a wide variety of ethnological specimens representative of the life of the Eskimos of Alaska and northern Canada, and illustrates their fine craftsmanship, artistic skill and practical ingenuity. The exhibit is a selection from a total of 533 pieces brought by the Borden party. Other material, consisting of bows and arrows, snowshoes, stone cooking vessels, lamps, fishing equipment, etc., will be used later in reinstalling the entire Eskimo collections of the museum.

THE production of fur-bearing animals in Alaska is to be studied under a cooperative agreement recently made between Governor George A. Parks, of Alaska, and the U. S. Bureau of Biological Survey. Dr. Earl Graves, veterinarian, has been selected to conduct the study. He will go into the problems incident to the production of fur for commercial purposes and advise fur farmers of Alaska in matters pertaining to the breeding and care of fur-bearing animals and the prevention and cure of diseases among them. The study will be carried on in cooperation with the Alaska Game Commission, the United States Forest Service, fur farmers' organizations and other agencies. The sum of $15,000 has been appropriated by the Territory for expenditure in the project in 1927 and 1928, in addition to funds that may be allotted by the Biological Survey from its regular appropriations.

As part of the plan to put all available data of interest to engineers into a convenient published form for use in connection with various engineering projects, the magnetic declinations in each state are being published by the United States Coast and Geodetic survey, according to an oral statement made to a representative of the *United States Daily,* by the editor, Roy Griffith. The publications will appear by states. The volumes for Arkansas, Florida, Missouri and North Carolina are already available, and those for California and Nevada are now in the press. These volumes give the variations of the magnetic needle from the true north and enable local surveyors to correct their compass readings according to the latest scientific findings. Descriptions and elevations of tidal bench marks in coastal states are also being published. Separate volumes for New York, Rhode Island and the District of Columbia have been printed and the tables for Connecticut are in the press. These books give the elevations above sea level necessary in such work as harbor construction and city planning.

A TRACT of thirty-nine acres of spruce-covered land on the westerly side of Watatic Mountain in Ashburnham, Mass., recently bought by the Associated Committees for Wild Life Conservation, has been formally turned over to the Commonwealth as a gift from the committees, to be used as a wild life sanctuary for all time. It adjoins the land which was given to the state by the Federation of Bird Clubs of New England. Announcing receipt of the land the State Division of Fisheries and Game says: "These gifts further emphasize the splendid work which the federation and the allied committees have done in bringing about the establishment of wild life sanctuaries. To the thinking conservationists of the country it has been apparent for some years that our only hope to maintain a permanent and sufficient stock of desirable forms of wild life is through the establishment of such permanent sanctuaries."

UNIVERSITY AND EDUCATIONAL NOTES

LAFAYETTE COLLEGE has received from Mr. John Markle, of New York, $500,000 for the construction and endowment of a building for the engineering department.

GROUND was broken for the new building of the Neurological Institute on October 19, adding another unit to the Columbia University medical center being constructed at 168th Street, New York.

THE cornerstone of the Mines Building of the University of Utah will be laid early this month. The building, costing $50,000, will be used exclusively by the research department of the mining division of the university and by the intermountain station of the United States Bureau of Mines.

AT the Armour Institute of Technology, Professor Donald F. Campbell has resigned and Associate Professor C. I. Palmer has been promoted to a full professorship of mathematics. Professor Palmer is also acting dean of students.

ASSOCIATE PROFESSORS J. H. KINDLE and Edward S.

Smith have been promoted to professorships of mathematics at the University of Cincinnati.

NEW appointments have been made to the medical staff of Dalhousie University as follows: Dr. R. P. Smith, of Edinburgh and Durham, has been appointed professor of pathology and bacteriology and fills the vacancy created by the resignation of Dr. A. G. Nichols; Dr. G. S. Eadie, of Toronto, who has spent the past two years at the biochemical institute of Cambridge University, has been appointed assistant professor of physiology; Dr. Elizabeth Smith Bean, formerly of the University of Wisconsin, has been appointed instructor in histology and embryology. Dr. Howard A. Jamison, of Glasgow, comes to the university as assistant in pathology and bacteriology, and G. A. Grant fills a similar position in the department of biochemistry.

HAROLD B. PIERCE has resigned as Fleischmann research fellow at the University of Rochester and has again assumed his duties as associate professor of dairy and food chemistry in the department of agricultural and biological chemistry at the Pennsylvania State College.

DR. PERRY YATES JACKSON, instructor in physiological chemistry at the University of Chicago, has been elected to a professorship in the department of chemistry at Park College, Mo.

DR. WILLEM JACOB LUYTEN, astronomer at the Harvard College Observatory, has been promoted to assistant professor of astronomy.

NEW appointments in the college of engineering and architecture at the University of Minnesota include C. A. Hughes and J. A. Wise, assistant professors of structural engineering. Mr. Hughes comes from the University of Toronto and Mr. Wise from the Corps of Civil Engineers of the U. S. Navy.

AT Lafayette College, Ernest M. Fernald, of Cornell University, has been appointed assistant professor of mechanical engineering and Anson W. Voorhees, assistant professor of geology.

AT the University of Buffalo, Dr. George Claude Hicks has been appointed assistant professor of biology; George E. Read, instructor in physics, and Dr. Reginald Pegrum, instructor in geology.

DR. M. A. GRAHAM, associate professor of chemistry at Mills College, has been appointed professor of chemistry at the Dominican College of San Rafael.

DR. PAUL A. MURPHY, formerly head of the plant diseases division, Department of Agriculture, Irish Free State, has been appointed to the newly created professorship of plant pathology in University College, Dublin.

DISCUSSION AND CORRESPONDENCE

EXIT THE TENTAMEN, BUT . . .

DR. HOLLAND in his recent letter to SCIENCE (July 1) has noted the decision of the International Commission on Zoological Nomenclature that that two-page work was not published, but was intended as a circular letter. He does not mention, however, that the *names* involved are not thereby eliminated, but are merely thrown back on later publications, and is entirely silent on the extraordinary confusion that will result from the fact that these later concededly valid uses are in general incidental, rarely naming a type or indicating the intended contents of the genera, or in any way defining them save by citing some one or more species as belonging to them.

For instance, take Limnas, which Dr. Holland mentions. In 1806 it appears in the Tentamen with the well-known species *chrysippus* (Linnaeus). Then in the period 1806–1816, but at dates that are not more exactly known, Hübner figures 16 species of Limnas in the "Sammlung Exotischer Schmetterlinge," thereby firmly fixing the name in a work that every one agrees is published. Incidentally a prospectus in our library shows that 15 Limnas were published in March, 1814. After that he abandons the name, and bases his binary nomenclature (which now becomes strictly binomial) on a series of "coitus" names, from the "Verzeichniss," which began to be published at that time. Later Boisduval on a plate of the Buffon Series, figures a *Limnas pixe,* belonging to a group which is not related to *chrysippus* L., but which *is* related to forms which Hübner excludes from Limnas. The corresponding text was never published. Then the question rises: Is the type of Limnas the first species published in the "Sammlung," which is now unknown, but may be fixed any time by the discovery of a new dated advertisement of the "Sammlung"? or does the ghost of the "Tentamen" fix it to *chrysippus* as soon as valid publication occurs? or does it become *pixe,* a species which Hübner did not know? or do we reject all this, and hunt for the first attempt at a *formal* founding of the name, all these uses being in a sense incidental and assuming that the Tentamen had established the name? or finally do we adopt the name from Hübner's "Systematisch-Alphabetisch Verzeichniss" of 1822, which every one admits was published, but which so far as I can find no one in America has seen? And in the last case does the name actually appear there? Some one in Europe who has a copy will have to answer that. Meanwhile what shall we do with the Danaids of the *chrysippus* group and the Erycinids of the *pixe* group?

Again, take Coleophora, which was in universal use for the best part of a century, and which is still in

9 per cent. of our literature. If we ignore the "Tentamen," it is preoccupied by Haploptilia, published somewhere about 1826. And it again was not formally founded so far as I can find out, but Zeller began to use it (doubtless from the Tentamen) about 1838 when he felt the need of a genus name for the group.

Nine tenths of the Tentamen names are now left in similar states of uncertainty. What would Dr. Holland do about it?

Incidentally I note an error or two in Dr. Holland's statement. As to the Tentamen being unused until Scudder recovered and reprinted it, it (or the names in it) was used by Hübner himself in the "Sammlung Exotischer Schmetterlinge" (for ten years), and it is said in the "Systematisch-Alphabetisch Verzeichniss," his last formal lay-out of the system; also by Ochsenheimer and Treitschke, Stephens, Herrich-Schaeffer, Zeller, Boisduval, Curtis and T. W. Harris. None of these authors adopted *all* the names, as the law of priority was not strictly construed in those days; also most people then did not feel the need of so many genera. Ochsenheimer specifically mentions the Tentamen, and Harris refers to Apatela as in common use. Others cite "Hübner" as author. Hübner himself says it was "partly accepted and partly rejected"—a true statement.

In bringing in the "Verzeichniss," Dr. Holland does not mention that ten years had intervened, and that in the meantime Hübner had used all the Tentamen names of butterflies as generic (as the first names of binomials), also many of the moths. This fact completely invalidates his argument.

WM. T. M. FORBES

CORNELL UNIVERSITY

PARASITIC COPEPODS

IN the *Sitzungsberichte* of the Vienna Academy of Science there recently appeared (vol. 133, p. 613) a paper by Helene Kurtz upon two new parasitic copepods. The first of these new species belonged to the genus Achtheinus, and in dealing with it a question as to the validity of the genus was raised. This question was decided in the negative and it was stated that Achtheinus must be regarded as a synonym of Dana's much older genus Lepidopus. Such a conclusion might seem legitimate at first, but if we follow the steps by which it was reached we realize that the mode of reasoning employed is very defective.

In Dana's genus the first legs were uniramose and 3-segmented, the second, third, and fourth legs were biramose, the rami of the second pair 2-segmented, of the other pairs 1-segmented and rudimentary; the terminal segment of the maxillipeds was flattened into a broad lamina covered with scales, but without a claw. In Achtheinus on the contrary all four pairs of legs are biramose, the rami of the first 3 pairs 2-segmented, of the fourth pair 1-segmented; the maxillipeds have an ordinary terminal segment, with a stout terminal claw, but without scales.

Dana's type specimen has long since disappeared and no others have been obtained that could be identified with it, and hence it is impossible to verify or disprove his genus by any reexamination of specimens. In such a case the validity of the genus must rest upon the original description and the figures illustrating it. Fortunately both of these in the present instance are clear and decisive. Dana recorded the first legs as uniramose, and his figure showed a distinctively uniramose and 3-segmented leg, bearing no resemblance whatever to the first legs of Achtheinus, nor to either ramus of those legs. In the second legs also the basipod is long and narrow and extends out laterally, with the two rami fastened to the outer end, a very different type of leg from that found in the second pair of the genus Achtheinus.

If Dana's genus is to be accepted at all, it must be given these exact details which he described and figured, and nothing can be added to them or subtracted from them. Especially is there no opportunity for conjectures or hypothetical inferences.

Stebbing in discussing South African Crustacea in 1918 (Annals South African Museum, vol. 17, part 1, p. 41) fully recognized these facts. Although he did suggest that the first legs of Dana's specimen "might easily have lost one of the branches in the process of dissection," he nevertheless adopted the genus name Achtheinus and added "the merely conjectural identity of Lepidopus may stand aside."

Miss Kurtz must have failed to understand Stebbing's attitude in the matter for she adopted his suggestion but ignored his real conclusion. Furthermore she carried the suggestion farther than he did by declaring that he had said that the endopod of the first legs in Dana's specimen was probably (wahrscheinlich) broken off. With this for a premise she argued that if the basal segment in the first legs of Dana's genus be regarded as the basipod, the other two segments would correspond to the exopod of the first legs in Achtheinus. And if we could find that "probably" broken-off endopod, and if it should prove to be 2-segmented when we did find it, then the first legs of the two genera would be similar. She considered this sufficient proof of the identity of the two genera and made Achtheinus a synonym of Lepidopus.

She disposed of the scaly covering of the terminal segment of the maxillipeds, which Dana used as the basis of his genus name, by saying that no such

structure had ever been found in the entire order of copepods, and hence Dana must have been mistaken in what he thought he saw. Steenstrup and Lütken described and figured a similar structure in the maxillipeds of their new genus Perissopus (Kongelige Danske Vidensk. Selskabs Skrifter, ser. 5, vol. 5, 1861, pl. 12, fig. 25), and there is every reason for believing the structure in both genera to be genuine.

Absolutely hypothetical reasoning like that quoted above can have but little influence, and it certainly does not possess sufficient merit to prove or disprove the validity of any genus.

CHAS. B. WILSON

DEPARTMENT OF EDUCATION,
WESTFIELD, MASS.

NEW DUST TREATMENTS FOR OATS SMUTS

SINCE the introduction of copper carbonate for wheat bunt control (Darnell-Smith, and Ross, 1919)[1] considerable interest has been shown in dust treatments for grain smuts. It was found by one of us (Thomas)[2] in field tests in 1924 that copper carbonate alone was not effective in controlling oats smuts. However, when one part of either copper carbonate or copper sulfate was mixed with two parts of mercuric bichloride the dust was effective. These mixtures are too expensive for general use even though rapid and easy of application. Other tests showed that the mixture was less effective when inert fillers were added. In 1926 a mixture of one part of copper sulfate, one part of mercuric bichloride and one part of cresylic acid was found to control oats smuts. While the cost of this dust was only about half that of the copper sulfate-mercuric bichloride dust, yet it is also too expensive for general use.

None of these dusts, although they gave satisfactory control of oats smuts, was as cheap as the liquid formaldehyde. This liquid treatment is objectionable because of the difficulty in handling the wet grain and the possibility of seed injury. Since formaldehyde is so effective against smut, and the wet methods of grain treatment are objectionable, an attempt was made to put formaldehyde in a dust form. This was done by mixing 40 per cent. formaldehyde with either infusorial earth or charcoal. These dusts stick well and thoroughly coat the grains when mixed with them. In these tests dusts containing 9 per cent., 15 per cent. and 25 per cent. of 40 per cent. formaldehyde were used, each at the rate of 3 ounces per bushel of grain. While the checks showed 47 per cent. smut the various formaldehyde dusts reduced smut to less than one per cent.

Another new treatment, iodine vapor dust, was tried in these same experiments. This dust was made by mixing finely ground solid iodine with infusorial earth. The iodine vaporizes readily at ordinary temperatures and diffuses through the infusorial earth giving it a light yellow-ochre color. This dust contained 5 per cent. by weight of iodine and was applied at the same rate as the formaldehyde dust. Only three smutted heads were found in three one-hundredth acre plots which were treated with this dust. It is possible that lower concentrations of iodine dust will also control the oats smuts. Further tests are under way. The cost of treating grain with these dusts is estimated at considerably less than 5 cents a bushel.

J. D. SAYRE
R. C. THOMAS

OHIO AGRICULTURAL EXPERIMENT STATION,
WOOSTER, OHIO

DO CATS SHARPEN THEIR CLAWS?

LAST winter the family cat (castrated male, 3½ years old) shed a number of claws in the house. These were found during January and February, some of them split lengthwise, the others intact. It struck the writer that the shedding of claws is probably a normal phenomenon with cats comparable to related phenomena, as that of the shedding of horns by deer. If this were true, it might be expected that some of the claws would be left in the bark of those trees which the cat used regularly for scratching. Upon investigation in April this bit of evidence was found in the form of two halves of a claw stuck into the bark of an elm and several halves lying under different trees used by the animal. The section of the bark was cut from the tree and with the pieces of claws has been mounted and placed in the college zoological museum.

This is but an isolated observation. There are good grounds, however, for believing the conjectured explanation to be correct. Cats do not instinctively or from experience select good grinding surfaces, slightly rough and hard, such as a cement walk, the foundation stone or the corner boards of a house, or smooth hard posts. They make use of the rough bark of trees which is always much softer than their claws. Observations of their scratching movements show that the animals do not scrape downward over the surface of the object, but catch the claws into the surface and with a circular stroke pull first downward and then outward and slightly upward. Careful examination of the cat's paws each time when a

[1] Darnell-Smith, G. P. and Ross, H. A dry method of treating seed wheat for bunt. *Agr. Gaz. N. So. Wales* 30: 685–692, 1919.

[2] Thomas, Roy C. Dust treatment for smut in oats. SCIENCE, No. 1567, Vol. LXI: 47–48. January 9, 1925.

claw was found failed to reveal any sign of injury. It was impossible to identify the toe from which the claw had dropped. This strikes the writer as fair proof that the shedding of claws is a normal phenomenon. The claws of the rear feet are possibly lost as they become loosened, or they may be pulled out by the animal with his teeth. Cats are frequently seen to pull at their hind claws in a manner suggesting this.

The shedding of claws is most likely seasonal, as are the related phenomena in other animals. Why then should the cat carry on the scratching movements throughout the year? It is possible that a further function of the scratching may be that of keeping the claws from curving too much, consequently growing into and irritating the paw. The irritation caused by claws which are curved too much or by the itching or other annoyance of loose claws may be the stimulus that starts the scratching movements. In this connection a colleague, a zoologist, has called attention to a reaction of badgers. These animals frequently drop out of an intense fight, roll over on their backs and scrape the claws of their front paws by rapidly drawing the paws across each other, pads facing. In accounting for the continuation of the scratching activity throughout the year, however, the likelihood of this being a habit reaction must not be overlooked.

OLE N. DE WEERDT

DEPARTMENT OF PSYCHOLOGY,
BELOIT COLLEGE

RECENT PUBLICATIONS OF THE NATIONAL RESEARCH COUNCIL

TWO recent publications in the National Research Council's *Bulletin* Series should be of rather wide interest among scientific men. One (Bulletin 58) is entitled "Handbook of Scientific and Technical Societies and Institutions of the United States and Canada." The American section of this bulletin was compiled by Clarence J. West and Callie Hull, and the Canadian section by the National Research Council of Canada. The other (Bulletin 60) is entitled "Industrial Research Laboratories of the United States, including Consulting Research Laboratories, Third Edition." This bulletin was compiled by Clarence J. West and Ervye L. Risher. Both bulletins are the output of the National Research Council's Research Information Service, of which Dr. West is director.

The purpose of publication of the handbook is to present a ready guide to those scientific and technical societies, associations and institutions of the United States and Canada which contribute to scientific knowledge or further research through their activities, publications or funds. Only those government institutions are included which administer private funds. Organizations directly controlled by universities or colleges have been omitted because it is expected that they will be covered by the forthcoming publication, "American Universities and Colleges," to be issued by the American Council on Education. Seven hundred and nine American organizations and seventy-four Canadian organizations are listed in the bulletin. The address of the secretary, the date of organization, the major object of the institution, the character of membership and amount of dues, time of meetings and information concerning publications are given for each institution.

The bulletin on Industrial Research Laboratories lists 999 such laboratories in the country, giving for each laboratory the name and address of the supporting industrial or commercial concern, the makeup of the research staff, and a list of special subjects to which the research activities of the laboratory are devoted. The first edition of this bulletin was published in 1920 and listed about 300 laboratories; a second edition (first revised edition) was issued in 1921 and listed about 600 laboratories. The present edition (1927) is the second revision of the bulletin.

The difficulties of compilation in connection with both of these publications make it inevitable that some errors, both of commission and omission, have been made by the compilers. The director of Research Information Service (National Research Council, Washington, D. C.) will be glad to have his attention called to any such errors noted by any who may have occasion to examine the bulletins.

VERNON KELLOGG

NATIONAL RESEARCH COUNCIL,
WASHINGTON, D. C.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

PREPARATIONS OF STAINED DECALCIFIED BONE WHICH RIVAL GROUND SECTIONS

GROUND sections of bone, besides being difficult to prepare, are often unsatisfactory for student use either on account of their thickness or due to the fact that they have been mounted in thin xylol-balsam, resulting in the displacement of the air from the lacunar and canalicular spaces of the tissue. It is, however, possible to prepare decalcified bone in such a way that all the advantages of canalicular detail are obtained. Two methods by Schmorl,[1] the picro-thionin and the thionin-phosphotungstic acid

[1] 1909. Schmorl, G. "Die pathologisch-histologischen Untersuchungenmethoden." Vogel, Leipzig.

methods, give excellent results and the detail demonstrated surpasses that observed in ground sections. With the exception of a few departments of dental histology, neither of these methods is in general use in American laboratories. I have been unable to find Schmorl's original description of his methods but they are repeated in a more recent work of 1909. An excellent discussion of the methods is also found in a paper on the structure of bone of Fasoli[2] and adequate directions for the successful use of these methods are given by Carleton[3] in his recent book on histological technique. References to Schmorl's methods may also be found in the works of Lange[4] and Fischer.[5] It seems unnecessary to completely outline the method since it can be readily obtained in English in a modern text-book on histological technique. Formol, Orth's, Müller's or Regaud's fluids may be used for fixing. Fluids containing mercuric chloride should be avoided. Best results are obtained with celloidin or frozen sections. If nuclear patterns are desired, the tissue should be first stained in alum-carmine or hemalum, as the success of the picro-thionin method depends entirely on the precipitation of the thionin in the lacunae and canaliculi. The picro-thionin method is best adapted to work with old bone, while the phosphotungstic acid method is more useful for demonstrating the histology of young bone and the process of ossification.

ALDEN B. DAWSON

DEPARTMENT OF BIOLOGY,
NEW YORK UNIVERSITY

SOME FIXATIVES FOR BOTH NUCLEI AND MITOCHONDRIA

A 2.5 per cent. solution of copper bichromate C. P. (Eimer and Amend) has a pH of 2.0. When root tips of Zea are fixed in it the fixation image is that of chromic acid, *i.e.*, the nucleolus appears as a spherical, darkly staining body in a hollow nucleus whose surface is composed of the chromatin reticulum. The mitochondria are either dissolved by the fixative or by the dehydrating alcohol. If, however, a slight excess of cupric oxide is added to the solution, the pH is altered to about 4.6 and the fixation image is greatly changed. There is here no hollow space around the nucleolus; the nucleus is a solid body, and in the resting stages the chromatin reticulum is much less distinct. In the dividing nucleus the spireme shows up distinctly and the chromosomes are well preserved. While the spindle fibers are not distinguishable individually, collectively they are well delineated. The mitochondria are well fixed and mordanted and can be followed through each of the mitotic stages. This fixative has the following faults: the resting nuclei show little detail, the cytoplasm is somewhat distorted and the outer layer of cells is generally over fixed. The addition of .05 per cent. acetic acid causes the resting nuclei to show more detail, though one must be cautious in the use of this acid, for a slight excess of copper acetate will dissolve the mitochondria. The most successful formula for the fixative is:

copper bichromate	5 grams
cupric oxide	1 gram
10 per cent. sol. acetic acid	1 c.c.
water	200 c.c.

The material should be left in the solution for from 36 hours to six days, and when thus fixed both chromosomes and mitochondria are well stained with Heidenhain's haematoxylin. Destaining should not proceed as far as is usual for an examination of the nuclei, for the mitochondria do not hold the stain as well as the chromosomes and can be completely decolorized before the chromosomes have started to fade.

It is very important to make up the fixative at least 24 hours before it is to be used. It must be shaken frequently in the interval and the excess copper oxide allowed to settle. If it is used too soon the fixation image will be that of chromic acid. It is best to wash out the fixative with 70 per cent. alcohol. If the dehydration is too prolonged the mitochondria will be dissolved out of the peripheral cells. A half hour in each of 70 per cent., 85 per cent. and 95 per cent. alcohol, and an hour in each of two changes of absolute, are sufficient for the dehydration.

Another solution which fixes both chromosomes and mitochondria is:

chromium trioxide	5 grams
glucinum carbonate	3 grams
water	200 c.c.

This also has a pH about 4.6. If there is no excess of glucinum carbonate a little more should be added, for otherwise the fixation image will be that of chromic acid. The fixed material should be dehydrated as described above. Material fixed in this solution appears very much like that fixed in the copper bichromate mixture; the cytoplasm is perhaps a trifle more granular and the mitochondria are thicker, otherwise the two fixatives are alike.

A third solution which fixes both chromosomes and

[2] 1905. Fasoli, G. "Ueber die feinere Struktur des Knochengewebes." *Arch. mikr. Anat.*, Bd. 66, S, 471.

[3] 1926. Carleton, H. M. "Histological Technique." Oxford University Press.

[4] 1913. Lange, W. "Histologische Technik für Zahnärzte." Springer, Berlin.

[5] 1910. Fischer, Bau und Entwicklung der Mundhöhle. höhle.

mitochondria apparently functions quite differently from the two just described. It is:

10 per cent. sol. chromic sulphate..... 1 part
8 " " " formalin neutralized with an excess of $CaCO_3$ or Li_2CO_3..... 1 "

If calcium carbonate is used the pH is about 2.2; if lithium carbonate is used it is about 4.8.

When this fixative is washed out with water and the dehydration proceeds slowly, the dividing nuclei and the cytoplasm appear beautifully fixed. The chromosomes are a trifle shrunken so that in the metaphase they show the split very clearly. The cytoplasm appears quite smooth with sharply delineated vacuoles. In the root tip the growth of the vacuoles and their behavior during mitosis can be easily followed. Unfortunately the mitochondria are dissolved out of the epidermis and cortex and remain only in the central cylinder. If the fixative is washed out with 70 per cent. alcohol and the dehydration is relatively rapid, the cytoplasm appears more granular and the mitochondria are preserved in nearly the whole tissue.

It is evident that there is an important relation between the pH of a bichromate and its fixation image. If it is too acid it will fix the chromatin but not the mitochondria, if it is too basic it will fix the mitochondria but not the chromatin. Certain bichromates in the presence of an oxide or a carbonate of the element which furnishes the cation will buffer at a point where they will fix both nuclear and cytoplasmic elements. Others, as their pH number is raised, suddenly change from nuclear to cytoplasmic fixatives. The pH of this point of change shows quite a range for the various bichromates. Thus ammonium bichromate pH 4.2 and potassium bichromate pH 4.4 are much too basic to fix the chromatin, while lithium bichromate pH 4.6 has the fixation image of chromic acid. Zinc bichromate pH 5.2 will fix both chromosomes and mitochondria with its characteristic fixation image.

A detailed description of the fixation images of various bichromates is being prepared.

CONWAY ZIRKLE

BUSSEY INSTITUTION,
HARVARD UNIVERSITY

SPECIAL ARTICLES

THE MnII SPECTRUM EXCITED BY RARE GAS IONS

THE MnII spectrum was excited by the method recently described by Duffendack and Smith[1] and tested by the writers[2] on the CuII spectrum. In this method rare gas ions on contact with Mn atoms ionize them and simultaneously excite them to the degree that the ionizing potential of the rare gas exceeds that of manganese, 7.4 volts.

An argon ion on contact with a Mn atom can ionize it and excite the resulting Mn^+ ion to the extent of $15.4 - 7.4 = 8.0$ volts. In the process the argon ion is neutralized by combination with an electron taken from the Mn atom and energy to the amount of 15.4 equivalent volts is made available. 7.4 equivalent volts of this is expended in extracting the electron from the Mn atom, leaving eight equivalent volts to be accounted for. Smyth and Harnwell and Hogness and Lunn[3] have demonstrated by positive ray analyses that ionization may occur upon contact between an ion and a molecule. In the investigations cited above[1,2] it has been demonstrated that the excess energy may go toward exciting the ion formed. Hence, when argon ions are used, one may expect to produce by this process Mn^+ ions excited to states whose levels are less than eight volts or 84,800 cm^{-1} above the normal state of Mn^+ but none excited to a higher degree. Consequently, lines of the MnII spectrum whose initial states are below 64,800 cm^{-1} should appear and lines originating in higher states should be absent from the spectrum thus excited. If, however, neon (ionizing potential 21.5 volts) is substituted for argon, Mn^+ ions excited to states whose levels are less than 14.1 volts or 114,210 cm^{-1} are produced and lines from these levels should appear in the spectrum.

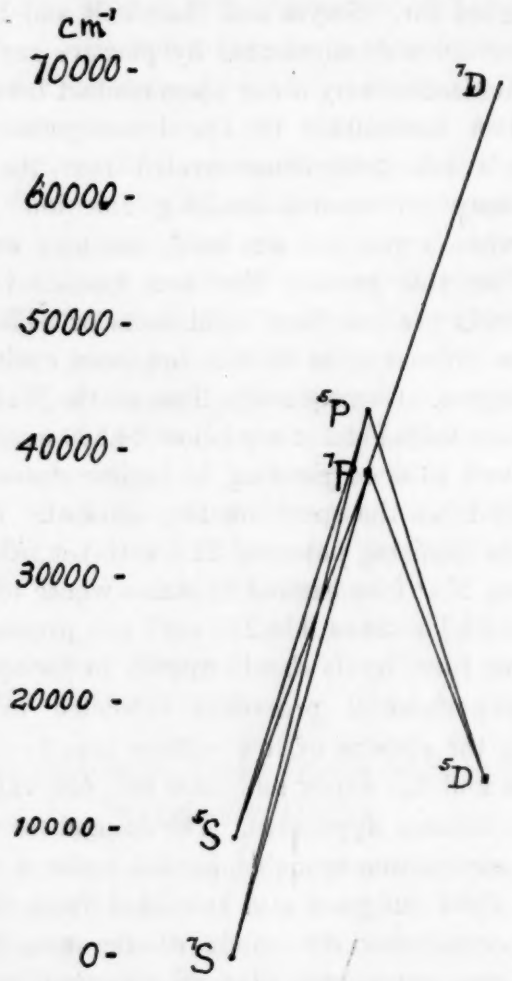
The experimental procedure consisted in photographing the spectra of low voltage arcs in mixtures of argon and Mn vapor and neon and Mn vapor in a tungsten furnace apparatus. The manganese was put into a molybdenum trough mounted inside a cylinder of thin sheet tungsten and insulated from it. This trough constituted the anode of the arc, and the cathode was a tungsten filament mounted inside the cylinder and parallel to its axis. The tungsten cylinder was itself mounted inside a metal water-cooled vacuum chamber, filled to the desired pressure with argon or neon, and was heated by passing a sufficiently large current through it. The manganese in the trough was thus vaporized and any desired vapor pressure could be maintained inside the cylinder. The filament was then heated and a low voltage arc maintained in the mixture of argon or neon and manganese vapor within the furnace. The spectrum of the arc was photographed through quartz windows sealed onto the vacuum chamber.

The results support the hypothesis outlined above. When argon was used, lines originating in the ^7P and

[1] *Phys. Rev.* 29, 914, 1927; *Nature*, May 21, 1927.
[2] *Phys. Rev.* 29, 925, 1927.
[3] *Nature*, Jan. 15, 1927; *Phys. Rev.* 29, 830, 1927; *ibid.*, 30, 26, 1927.

^5P levels (Fig. 1) appeared in the spectrum but none from the ^7D level. When neon was substituted for argon and all other conditions kept the same as before, the $^7P - {}^7D$ lines came out strongly.

This work led us naturally to the analysis of the MnII spectrum. In 1923 Catalan[4] published four multiplet arrangements in the spark spectrum of manganese which can easily be recognized as $^7S - {}^7P$, $^7P - {}^7D$, $^5S - {}^5P$, and $^5D - {}^5P$. The lowest term of the MnII spectrum may be expected to be the ^7S term and so the levels of the septet terms were immediately established, as shown in Fig. 1. Catalan's multiplets



enabled us to determine the relative levels of the quintet system and so the first problem was to find intercombination lines which would fix the positions of the two systems with respect to each other. The difference $^5S - {}^7S$ can be estimated from convergence limits in the MnI spectrum.[5] Dr. O. Laporte, who has given us valuable suggestions on the nature of the MnII spectrum, had recently calculated this difference and furnished us his result, 9,477 cm^{-1}. Using this value, intercombination lines were quickly found which fixed the difference at 9,474.3 cm^{-1} and established the relative positions of the two systems. Lines have been found for the transitions indicated in Fig. 1, and the work of completing the analysis of the spectrum is in progress. The similarity of this spectrum to that of CrI is apparent from a comparison of their diagrams.[6]

J. G. BLACK,
O. S. DUFFENDACK
PHYSICS LABORATORY,
UNIVERSITY OF MICHIGAN

FOG PRECIPITATED BY TREES

THE collection by vegetation of moisture from fog has interested me for a long time. I recently found an opportunity to approximately measure the amount collected by trees.

During the summer west winds blow the moisture-laden air from the Pacific Ocean up and over the hills back of Berkeley, California. Nearly every afternoon fog collects on the hills at elevations above 800 feet and stays until the morning sun dissipates it. Occasionally it remains the entire day.

About twenty-five years ago pine and eucalyptus trees were planted on the sides and tops of the hills over large areas which prior to that time were bare of all but grass. Trees were found only in canyons, while brush covered many of the slopes, particularly those sloping to the north. These trees grew slowly for a number of years but have made very rapid growth in the dry years since 1917. The summers here are nearly rainless and all vegetation on the hills usually dries up during this rainless season, except in protected spots and in canyons where moisture is more plentiful.

I have long noticed that the soil beneath trees is more moist than elsewhere, the additional moisture coming from the collection of water from the fog dripping to the ground. I recently (July 31) collected samples of soil from beneath trees and from ten feet from trees, where soil and other conditions were identical. Samples were collected from surface to 12 inches depth and the moisture determined. Here are the results:

	Percentage of Moisture	
	Under tree	Ten feet from tree
Monterey Pine—Elev. 1,500 ft.	24.4	7.8
Monterey Pine—Elev. 1,600 ft.	28.5	7.7
Eucalyptus —Elev. 1,650 ft.	22.9	9.4

Assuming the weight of soil as 90 lbs. per cubic foot, these differences in percentage are equivalent to the following in inches of rainfall. Pine, elevation 1,500 feet, 2.87 inches. Pine, elevation 1,600 feet, 3.60 inches. Eucalyptus, elevation 1,650 feet, 2.33 inches. The soil was moist much deeper than 12 inches, so the total difference in inches of water collected is much above that shown.

The area of ground covered by trees, where the

[4] *Phil. Trans. Roy. Soc.* 223, 127, 1923.

[5] McLennan and McLay: *Trans. Roy. Soc. Canada* 20, 15, 1926.

[6] Catalan: *Anales Soc. Esp. de Fis. y Quim.* 21, 84, 1923.

stand is full, approximates 25 per cent. of the ground area. The moist spots are under all trees where the wind blows up or over the slopes; in some cases moisture has collected fast enough to form puddles and run down the slopes in rivulets. Away from the trees the ground is dry as it usually is in summer.

The trees average 15 feet in height for pines and 20 for eucalyptus, the trunks from 6 to 10 inches thick. Small trees, brush and grass collect relatively little moisture.

The effect of this additional moisture collected from fogs in the dry season is readily noticed in the rapidity of growth. As the trees become larger their collecting area increases.

THOS. H. MEANS

ACTION CURRENTS FROM MUSCULAR CONTRACTIONS DURING CONSCIOUS PROCESSES[1]

IN the course of investigations on the influence of general muscular relaxation[2] upon the occurrence of various types of conscious processes, we arrived at a fairly uniform result. After a period during which relaxation had been sufficiently advanced and generalized, all the subjects (23) who had been adequately trained as judged by certain tests agreed, under controlled conditions, in giving independent reports that there had been for the time a notable diminution or virtually total disappearance of conscious processes. These included not alone so-called kinesthetic activities but also visual and auditory imagery, attention, reflection and emotion. Extreme relaxation of the muscles of the eyes and of speech seemed of conspicuous importance.

When these subjects were requested to engage in reflection or other conscious activity, but at the same time to seek to relax extremely, they reported that they did one or the other but could not do both. Extreme relaxation was found to be incompatible with the simultaneous presence of conscious activities. When the subjects relaxed extremely to a point where they later reported diminution or absence of mental activity, the muscles of the eyes and face assumed a flaccid appearance which gave characteristic photographs. Association time was greatly prolonged or no associations appeared. The subjects, who were highly trained in observing and critically reporting their sensory experiences, agreed in discerning an experience as of a muscular contraction occurring at the moment of conscious activity and appearing to constitute a part of the conscious process. We are reminded of the assertion of Hughlings Jackson that a motor element is involved in every conscious activity.

To test this conclusion from another direction, we have begun to employ the string galvanometer with vacuum tube amplification. Ours is the first application of that instrument (unpublished in 1921), we believe, to the question whether action currents are given off by muscular contractions associated with imagery, reflection, attention and other conscious processes. Early tests in a preliminary way without amplification on imagined flexion of the biceps brachial group have given positive results. It is necessary, however, to control the methods very carefully and to apply the tests to various parts of the musculature during various types of conscious processes, before the foregoing conclusions can be adequately tested or confirmed. This is now being done.

EDMUND JACOBSON

HULL PHYSIOLOGICAL LABORATORY,
UNIVERSITY OF CHICAGO

[1] Preliminary report.

[2] Jacobson, E. 1924. *Jour. of Nerv. and Mental Dis.*, LX, 568. 1925. *Am. Jour. of Psychol.*, XXXVI, 73.

THE NATIONAL ACADEMY OF SCIENCES

AT the annual meeting of the National Academy of Sciences, held in Urbana, on October 18, 19 and 20, at the University of Illinois, the following papers were presented:

Further evidence on the constancy of the light of stars: JOEL STEBBINS. At the Washburn Observatory, University of Wisconsin, tests of the light of different classes of stars have been made by the writer and C. M. Huffer. From the samples studied it is inferred that white and yellow stars are fairly constant in their radiation, but that the red stars are likely to vary in light, particularly the very red and relatively cool bodies. The amount of the change is often ten or twenty per cent. within two weeks or a month. Nearly one third of the red stars in general, and all of the largest stars like Betelgeuse, are variable in this fashion. It is probable that the surfaces of these stars are covered with spots like those on the sun, and that the bodies are in early stages of development.

An attempt to detect the Einstein displacement at the limb of Jupiter: PHILIP FOX (introduced by Henry Crew). The displacement of star images at the limb of the sun observed at the time of total eclipses has been demonstrated by several observers with values closely approximating the amount predicted by Einstein. On April 28, 1923, Jupiter occulted the star BD–14° 4069. The circumstances of this phenomenon were observed at the Dearborn Observatory. A series of plates were exposed successively as Jupiter approached and receded from the star. This note presents the results of the observations and the plans for a similar occultation which will occur on the evening of December 7, 1927.

An after-image of the yellow spot: J. MCKEEN CATTELL. Loewe, Haidlinger, Clerk Maxwell and Helmholtz have described in detail the entoptic phenomena connected with fovea centralis and the yellow spot. If one looks at a blue surface or preferably through a blue glass or a solution of chrome alum, a dark spot appears in the center of the field of vision. Skilled observers may see a dark halo with a bright ring surrounding the spot. The observation here put on record is that after the retina has been fatigued by the blue light, if the eyes are turned to a white surface, say the clouded sky, a bright yellowish after-image of the yellow spot appears, comparable to the sun seen through the clouds. The yellow spot has been protected from the blue light by its pigment and is relatively more sensitive to the white light. Another observation that may be put on record is that about twenty-five years ago I obtained an after-image that still exists. The after-image followed exposure of the eyes for one minute to the clear sky through the cross-bar of a window. This positive after-image, which I can now see with closed eyes, may be due to permanent changes then caused in the retina, or it may be reinforced by attention. Newton describes an after-image of the sun that lasted three years.

Presbyota and the causes of deficient hearing: J. MCKEEN CATTELL. Presbyopia is well-known, but in so far as there is an analogous condition of the organ of hearing it has been so little considered that a new name must be invented for it. Oliver Wendell Holmes noted that in old age tones of high pitch, as the chirping of a cricket, can not be heard, and the upper limit of audible pitch is now measured by the Galton whistle and other methods. In the Bell Telephone Laboratories Dr. Harvey Fletcher, following work of Professor Seashore and others, has recently perfected an audiometer for measuring acuity of hearing for tones of different pitches, records from which are exhibited. Attention is here called to the fact that deficiency of hearing is due not only to failure to respond to the energy of the stimulus as measured by the audiometer, but also to the fusion of successive stimuli and that this condition may be normal after middle-life. Vision is a space sense; hearing a time sense. The inertia of eye and the fusion of visual sensations have been thoroughly investigated, but we have no corresponding information in regard to the fusion of auditory sensations. Sounds separated by one five-hundredth of a second can be discriminated, but with speech sounds given at longer intervals are fused. We can speak about as rapidly as we can hear—some twenty changes a second—and this may have evolutionary significance. In order to be heard by one of deficient hearing, or by an audience, it is necessary to speak not more loudly, but more distinctly and more slowly. The conditions are analogous to the loud speaker of the radio or to transmission on the telephone line, where increased loudness increases the distortion and blurring of the waves. As the muscular system of the eye controlling the curvature of the lens becomes flaccid with age, so the receptor in the ear may be expected to lose its elasticity with age. It does not respond to the more rapid vibrations and has greater inertia, so that a longer period is required to set it in motion and the motion may subside more slowly. There is consequently fusion of successive sounds, which are besides less distinctive because the higher overtones are lacking. A loss of acuity of hearing of 30 per cent. is a small matter, for one can hear a conversation as well at six feet as at three, but the fusion of successive stimuli makes close attention necessary and explains the difficulty that older people experience in listening to an address or theater performance.

The correlation between intelligence and speed in conduction of the nerve impulse: LEE EDWARD TRAVIS (introduced by C. E. Seashore).

The collection of Negro songs by phonophotography: MILTON METFESSEL (introduced by C. E. Seashore).

Environment and context: MADISON BENTLEY (introduced by S. A. Forbes).

The beginnings of cerebral cortex: C. JUDSON HERRICK. The lowest vertebrates have no fully differentiated cerebral cortex, that is, superficial gray matter in the forebrain. This appears first in reptiles. In the Amphibia cortical territory can be recognized, but true cortex is not differentiated within it. An analysis of this territory reveals the physiological factors operating in a phylogenetic stage just antecedent to the appearance of true cortex. The intrinsic functions of association, so characteristic of human cortex, here provide the physiological motivation for the actual differentiation of cortex as we see it in reptiles. Yet no cortex appears in Amphibia. The reason is that a certain measure of anatomical localization of function in cortical territory is prerequisite for the appearance of cortex in this territory. The Amphibia have three local fields of "primordial cortex," but only two of these have specific connections through projection fibers with distinctive subcortical reflex centers. In reptiles the third field also has acquired its own system of such projection fibers. Cortex never appears in a single isolated field, but at least three fields with distinctive subcortical connections are necessary for its differentiation, which occurs simultaneously in all of them.

Studies on the thyroid: A. J. CARLSON.

The effect of raised intrapulmonic pressure upon the knee jerk, arterial blood pressure and state of consciousness: ARNO B. LUCKHARDT (introduced by A. J. Carlson). In the dog raised and maintained intrapulmonic pressure leads to a sharp drop in the general arterial blood pressure accompanied by a diminution of the knee jerk or its complete abolition. The effects on the knee jerk center are due, for the most part, to changes in the circulation through the brain and cord (anemia and asphyxial depression). The diminution of the knee jerk may in part be due to reflex inhibition of the knee jerk center as a result of stimulation of the sensory fibers of the pulmonary vagus. A similar drop in general arterial

pressure results in man from a forced and maintained increase in intrapulmonic pressure. The drop in pressure in man and dog under conditions of raised intrapulmonic pressure is due to an interference with the filling of the left heart. Depending on the extent of the drop in the general arterial blood pressure, there ensues giddiness or arterial unconsciousness. The compensatory after fling in the blood pressure (on release of the intrapulmonic pressure) is responsible for the symptoms of nausea, fullness of the head and general discomfort.

Studies of conditioned reflexes: N. KLEITMAN. Dogs with salivary fistulae were placed in a stand for a period of time varying from 15 minutes to two hours, and were then given an injection of morphine subcutaneously. Daily repetition of this procedure resulted in the development of a conditioned salivation starting as soon as the animals were put in the stand. The curve of development of this conditioned reflex is S-shaped, showing first a positive acceleration and then a negative one. The extinction of the conditioned reflex when the daily injections are discontinued follows a concave curve, which in some dogs is a second degree parabola. The abolished conditioned reflex may be reestablished by resuming the injections of morphine, and it reaches its height of development in less time than it takes to establish it for the first time. The establishment, extinction and reestablishment of the conditioned reflex resemble closely learning, forgetting and relearning nonsense syllables. Starvation acts deleteriously on the course of the fully established reflex or prevents its proper development. This is not due to a decrease in water consumption observed in fasting, nor to a decrease in size of the salivary glands. It is probably due to a depression of the activity of the centers in the nervous system resulting from starvation.

The action of trypanolytic sera in vivo: WILLIAM H. TALIAFERRO (introduced by S. A. Forbes). Mice infected with *Trypanosoma equinum* exhibit a progressive infection with a constant increase of the parasites in the blood until death which occurs on the fifth or sixth day in our strain. If, however, a suitable dose of trypanolytic serum (serum obtained from guinea pigs, rabbits or sheep after a natural trypanolytic crisis) be injected into an infected mouse, there is a lysis of the parasites (crisis) in about one hour, then a period of several days in which no parasites can be found in the peripheral blood and eventually a relapse during which the parasites increase steadily until the death of the mouse. The length of life of such treated mice is prolonged over that of untreated controls about as long as the crisis lasts. A peculiar anomaly sometimes appears when a series of infected mice at the same stage of infection are given different amounts of lytic serum. Doses of lytic serum greater than the minimal effective dose instead of all producing lysis of the parasites show recurrent zones of effectiveness and non-effectiveness. This zonal phenomenon is superficially similar to the animal experiments of Pfeiffer (1895) and others on the protective (as distinguished from the present curative experiments) action of antibacterial sera and to the so-called Neisser-Wechsberg phenomenon in test-tube experiments. Such peculiarities in the action of immune serum in the animal body, besides its theoretical interest, may have a distinct bearing on the use of immune sera in the treatment of disease. In *T. equinum* the occurrence of zonal phenomena is directly correlated with the number of trypanosomes present in the blood at the time the immune serum is administered. In one strain (experiments of T. L. Johnson) if there are from 1 to 5 parasites per microscopic field when the lytic serum is given there is no zonal phenomenon, but all doses greater than the minimal effective dose are similarly effective. If, however, there are from 9 to 33 parasites per field doses greater than the minimal effective dose show alternate zones of effectiveness and non-effectiveness. Finally, if there are from 45 to 50 per field no dose of immune serum so far used has been found effective. The absolute number of trypanosomes per field necessary for the occurrence of zonal phenomena is constant for each single-cell strain, but varies with different strains. Although the present series of experiments has not offered an adequate explanation of zonal phenomena they throw considerable doubt on various explanations which have been offered in bacteriological literature. Thus, it is impossible to assume that the phenomenon is dependent upon inactivation because we have obtained it repeatedly with active as well as inactivated serum. In the protective experiments with bacteria there is considerable evidence that even where a large dose of serum does not protect the animal, the serum actually kills the bacteria and the assumption is made that the animal dies as a result of the consequent liberation of endotoxins. In our work, however, where a large dose of serum is ineffective the trypanosomes are not killed. Recent investigators have postulated two substances in immune serum—one protective and the other antagonistic to the host's resistance and explained the ineffectiveness of large doses as due to the increased amount of antagonistic substance. This is untenable because it would imply a point after which all larger doses would be non-effective and would not explain the recurring zones found in our work. Finally, variability in the host's reaction can not be the basis because the phenomenon is directly dependent upon the number of trypanosomes present when the serum is injected. That the final explanation of the results both in bacteriological as well as trypanosome work will have to include the relation of the number of organisms present when the serum is given is indicated by the fact that the zonal phenomena in the protective action of antipneumococcus serum is also dependent upon the amount of virus injected with the serum. (Unpublished work of F. A. Coventry.)

Concerning certain ecological methods of the Illinois Natural History Survey: S. A. FORBES. It is the object of this paper to describe and illustrate by examples some of the uses of statistical ecology in determining relative frequencies of the several species of animals in the various ecological situations of an area which they inhabit, thus ascertaining the ecological preferences of species and their

organization in communities on the basis of an identity, or at least similarity, of such preferences. By a comparison of these ecological preferences, in species so closely allied in classification as to suggest their relatively recent differentiation, some evidence is found of the existence of ecological barriers separating such species, and of the possibility of the influence of ecological segregation in promoting their specific differentiation. The Illinois distribution and ecological relations of three species of fishes are used as an example. Ecological affiliations among the species of birds are shown by determining the numbers per square mile of each species found in each ecological situation of an area surveyed, and examples are given of the use of data so obtained in studying the movements of birds in complete or partial migration. The northern flicker, the common crow and the prairie horned lark are used as examples of a partial seasonal redistribution of species which are classed as permanent residents in Illinois. Finally, a more complex method is presented of distinguishing ecological communities, ascertaining their limits and evaluating the strengths of the affiliations of the several species of a community by determining for each pair of species a coefficient of association, based on the actual frequency of their joint occurrences in collections, the calculus of probabilities being used to distinguish joint occurrences attributable to random distribution from those due to ascertainable ecological causes. Through a comparison, tabulation and grouping of such coefficients, community relations are readily recognized, details of ecological relationship across definite community boundaries are made evident, and the intricate web of the relations of all the inhabitants of a complex area to their physical environment and through this to each other are disclosed.

Influence of a power dam in modifying conditions affecting the migrations of the salmon: HENRY B. WARD (introduced by S. A. Forbes). The migration routes of the Pacific salmon are determined by external conditions which have been recognized in part at least. The streams which they frequent are peculiarly adapted for utilization as sources of water-power. The installation of high dams has modified natural conditions in ways affecting conspicuously the movements of the fish. First of all the dam offers a physical obstacle to the movements of the fish; this has not been satisfactorily overcome by installations yet devised—other less evident changes are wrought in the environment. The newly formed lake replaces a rapid, broken stream by a large body of still water. The current which has exerted a directive influence is eliminated. The water is less highly oxygenated —though in many cases not seriously changed. Temperature conditions are most radically altered and apparently affect the movement of the salmon conspicuously.

Morphologcial changes in the nuclei of the subcuticula in the Acanthocephala: H. J. VAN CLEAVE. In tracing the embryological development in Pomphorhynchus, Hamann, in 1891, showed that the subcuticular nuclei are first recognized as giant spherical or ovoid bodies. Later in development these become progressively more amoeboid until finally each nucleus fragments into a large number of small rounded bodies scattered through the subcuticula of the adult. Recently there have been frequent references to peculiarities in nuclei of adult acanthocephalans with no attempt at correlation observations on the different forms. On the basis of the subcuticular nuclei alone, the genera of Acanthocephala may be arranged in a phylogenetic series following the same progressive changes in nuclear form outlined in the ontogenetic series by Hamann. In all members of the family Neoechinorhynchidae, the subcuticular nuclei of the adult are rounded giant nuclei, essentially like those of the larvae throughout the group. In adults of the genera Pandosentis, Quadrigyrus and Leptorhynchoides there is progressive emphasis of the amoeboid tendency of these nuclei, culminating in Leptorhynchoides. Many other genera, including Acanthocephalus, Echinorhynchus and Pomphorhynchus, enter the adult state with numerous small rounded nuclear masses scattered throughout the subcuticula.

The development of individuals from aggregated cells in Corymorpha: C. M. CHILD (introduced by F. R. Lillie). In the course of work at the Scripps Institution, La Jolla, California, during the past summer the methods used by H. V. Wilson were applied to the large tubularian hydroid, *Corymorpha palma.* The naked stalk regions of these animals were ground with moist sand in a mortar, water was then added and the fluid strained through bolting cloth, 150 meshes to the inch. The somewhat milky fluid passing the cloth was then allowed to settle in tubes. During the first two to three hours following dissociation aggregation of the cells and small cell masses into larger masses and sheets occurs rapidly, the surfaces adhering to each other when they come into contact, but the capacity for aggregation is gradually lost. All aggregates approach or attain spherical form and those 2 mm or more in diameter usually die, but smaller aggregates or pieces cut from the larger may live and give rise to new individuals or partial individuals in 4 to 5 days or more slowly. The environmental differential to which the aggregate is exposed on the bottom of the container is a factor in determining the polarity of the new individual. The upper, freely exposed surface or some part of it tends to develop into the apical region and the region in contact with the bottom, into a more proximal level or a basal end. Aggregates frequently turned over and moved about develop basal ends less frequently than those allowed to remain undisturbed. That physiological polarity originates in a quantitative gradation in physiological activity or condition of protoplasm is shown by many lines of evidence for both animals and plants. In the present case the environmental differential between the freely exposed region of the mass and that in contact with the bottom apparently serves to establish this gradation and so to determine the order of parts along the axis.

(To be continued)